

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TP102502TPu	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/FI 2003/000979	International filing date (day/month/year) 22-12-2003	Priority date (day/month/year) 23-12-2002
International Patent Classification (IPC) or national classification and IPC G02B5/32, G03H1/02, G11C13/04		
Applicant Metso Corporation et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☒ (sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |

Date of submission of the demand 22-07-2004	Date of completion of this report 14-04-2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Anna Lundqvist /LR Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000979

Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1 - 30 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished

pages* _____ as amended (together with any statement) under Article 19

pages* 27 - 30 received by this Authority on 2005 - 04 - 07

pages* _____ received by this Authority on _____

☒ the drawings:

pages 1 - 6 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing (*specify*): _____

☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FI 2003/000979

Box No. V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-25</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-25</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-25</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

This application relates to a micro-optical grid structure formed on a substrate arranged to produce a holographic effect for a viewer in a certain observing direction and a free range of angles between adjacent observing directions.

Reference is made to the following document:
D1: US 5142384 A

Document D1, which is considered to represent the most relevant state of the art, discloses holograms used in connection with packaging means and for display purposes from which the subject-matter of claims 1, 8 and 15 differs in that the grid structure is embossed on a non-metallic material and that the ratio of the grid period to the visible wavelength is smaller than 5. The subject-matter of claims 1, 8 and 15 is therefore novel (Article 33(2) PCT). It also meets the requirements of the PCT with respect to inventive step.

Claims 2-7, 9-14 and 16-25 are dependent on claims 1, 8 and 15 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

The invention is industrially applicable.

Document D1 has been reconsidered to only represent the general state of the art.

Claims:

1. A micro-optical grid structure (G) produced on a substrate (S), said grid structure (G) being produced as a surface structure, a structure
5 protected with a protective layer, or as an entirely or partially buried structure, which grid structure (G) is arranged to produce for a viewer a holographic or a corresponding visual effect based on the diffraction of light by directing the light diffracted from said grid structure (G) and corresponding to a visible wavelength (λ) substantially to one or more
10 diffraction orders (m), each single diffraction order (m) corresponding to a certain observing direction (m, β) of the visual effect observable at said visible wavelength (λ), and said grid structure (G) being arranged to leave a free range of angles such that said grid structure (G) being examined from directions corresponding to said range of angles does
15 not produce for the viewer a clearly observable effect based on diffraction, **characterized** in that said grid structure (G) is embossed, the ratio of the grid period (d) of said grid structure (G) to said visible wavelength (λ) being smaller than 5, and said grid structure (G) comprising non-metallic material only.
- 20 2. The grid structure (G) according to claim 1, **characterized** in that said grid structure (G) is arranged to direct the light diffracted therefrom substantially in only one diffraction order (m), i.e. substantially in only one observing direction (m, β) that preferably corresponds to the
25 diffraction order $m = -1$.
3. The grid structure (G) according to claim 1 or 2, **characterized** in that said free range of angles is at least 10° .
- 30 4. The grid structure (G) according to any of the preceding claims 1 to 3, **characterized** in that said grid structure (G) is produced on a substantially transparent substrate (S).
- 35 5. The grid structure (G) according to claim 4, **characterized** in that said substrate (S) is made of plastic or lacquer, preferably of a plastic film or a lacquer layer.

6. The grid structure (G) according to any of the preceding claims 1 to 5, **characterized** in that said grid structure (G) is produced on paper, paperboard or other corresponding substrate (S).

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7. The grid structure (G) according to any of the preceding claims 1 to 6, **characterized** in that the substrate (S) of said grid structure (G) comprises one or several dielectric thin film coatings on the entire surface area of the substrate or only at the locations corresponding to said grid structure (G).

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8. A method for producing a micro-optical grid structure (G) on a substrate (S), said grid structure (G) being produced as a surface structure, a structure protected with a protective layer, or as an entirely or partially buried structure, which grid structure (G) is adapted to produce for a viewer a holographic or corresponding visual effect based on the diffraction of light, said method comprising at least selecting the shape of the grid profile of said grid structure (G) together with the grid parameters (d , h , c , n_s) such that the light diffracted from said grid structure (G) and corresponding to a visible wavelength (λ) is directed substantially to one or more diffraction orders (m), each single diffraction order (m) corresponding to a certain observing direction (m, β) of the visual effect observed at said visible wavelength (λ), and a free range of angles remaining such that said grid structure (G) being examined from directions corresponding to said range of angles does not produce for the viewer a clearly observable effect based on diffraction, **characterized** in that said method further comprises embossing said grid structure (G) such that the ratio of the grid period (d) of said grid structure (G) to said visible wavelength is smaller than 5, said grid structure (G) comprising non-metallic material only.

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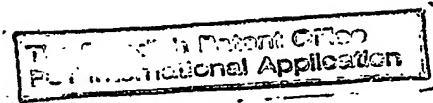
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9. The method according to claim 8, **characterized** in that the value of the incidence angle (α) of light impinging upon said grid structure (G) at said visible wavelength (λ) is fixed, and the ratio of said grid period (d) and said visible wavelength (λ) is selected such that one desired observing direction (m, β) is attained, said observing direction being

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preferably selected so that it corresponds to the diffraction order $m = -1$, wherein the desired design wavelength (λ) is diffracted to said one observing direction.

- 5 10. The method according to claim 8 or 9, **characterized** in that the parameters (d, h, c, n_s) of said grid structure (G) are selected in such a manner that the free range of angles is at least 10° .
- 10 11. The method according to any of the preceding claims 8 to 10, **characterized** in that the diffraction efficiency to said one or more observing directions (m, β) is affected by the selection of the parameters (d, h, c, n_s) of said grid structure (G).
- 15 12. The method according to any of the preceding claims 8 to 11, **characterized** in that the width (c) of said grid profile (G) is selected to be substantially half of said grid period (d).
- 20 13. The method according to any of the preceding claims 8 to 12, **characterized** in that substantially one quarter of the value of said visible wavelength (λ) is selected as the value of the height (h) of said grid profile.
- 25 14. The method according to any of the preceding claims 8 to 13, **characterized** in that a substantially transparent material, preferably plastic, lacquer or the like is selected as the substrate (S) of the grid structure.
- 30 15. A product containing one or several a visual, holographic, or corresponding effects based on the diffraction of light, **characterized** in that said product comprises one or several pattern areas (A, B, C, D), which single pattern area is formed of the grid structure (G) according to any of the preceding claims 1 to 7 or produced by means of the method according to any of the claims 8 to 14.
- 35 16. The product according to claim 15, **characterized** in that said product is made of plastic, preferably of a plastic film.



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17. The product according to claim 15, **characterized** in that said product is made of paper, paperboard or a corresponding material.
- 5 18. The product according to any of the preceding claims 15 to 17, **characterized** in that said product is of packing material.
19. The product according to any of the preceding claims 15 to 17, **characterized** in that said product is a printed product.
- 10 20. The product according to any of the preceding claims 15 to 19, **characterized** in that said product is made of substantially transparent material.
- 15 21. The product according to any of the preceding claims 15 to 20, **characterized** in that the basic material of said product at the same time acts as the substrate (S) of the grid structure (G).
22. The product according to any of the claims 15 to 21, **characterized** in that when the product comprises several pattern areas (A, B, C, D), at least two of said pattern areas have different observing directions (m, β) and/or design wavelengths (λ).
- 20 23. The product according to any of the preceding claims 15 to 22, **characterized** in that said one or several pattern areas (A, B, C, D) form as an effect a trademark, a logo, a product description or the like.
- 25 24. The product according to any of the preceding claims 15 to 23, **characterized** in that said one or several pattern areas (A, B, C, D) form as an effect characters or text.
- 30 25. The product according to any of the preceding claims 15 to 24, **characterized** in that said product comprises several adjacent pattern areas (A, B, C, D) that are similar to each other and that are arranged to form together a larger area with a substantially uniform visual effect.
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